

Center for Independent Experts (CIE) Report

External Independent Peer Review by the Center for Independent Experts under the Western Pacific Stock Assessment Review framework

2017 Benchmark Stock Assessment for the
Main Hawaiian Islands Deep7 Bottomfish Complex

Honolulu, HI, November 13-17, 2017, at the NOAA Pier 38 Facility

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Executive Summary

The fishery on the Main Hawaiian Island (MHI) Deep7 Bottomfish Complex has been quite stable for over half a century. Fishing pressure is moderate and most likely below F_{msy} and the stock above B_{msy} for most of the time and at present.

A benchmark assessment for the Deep7 Bottomfish complex was prepared for the Western Pacific Stock Assess Review (WPSAR) framework, which was conducted November 13-17, 2017 in Honolulu, HI. The review panel consisted of Dr. Cathy Dichmont (Australia), Dr. Henrik Sparholt (Denmark), and Dr. Steven Martell (USA). The primary documents under review were about commercial catch data filtering, a new fisheries independent survey, and the assessment of the stock status for the Deep7 Bottomfish Complex.

The review focused on: 1) data filtering, 2) CPUE standardization, 3) development of a fisheries independent survey index, 4) fitting a biomass production model to these data, and 5) undertaking stock and catch projections. Presentations were provided on each of these activities.

The review panel recognized the tremendous amount of effort by the staff in preparing the assessment and excellent documentation. The presentations were of the same high quality. The panel greatly appreciated the industry's clear and comprehensive presentation of the fishing operations and its history. Coming as a complete outsider to this area and fishery, this was especially useful for me.

The panel discussed the assessment materials in the context of the terms of reference provided for this review.

Non-reporting of catches in the past and at present of a very substantial part of the annual catch (around 50%) is a major uncertainty of the assessment. Increased effort to estimate that in the future could be an important improvement of the future assessment of the Deep7 stock complex. Several existing area closures to the fishery, however, offer a buffer to the management of the fishery.

Generally, the data compilation and filtering done via five workshops in the past few years have improved the data basis substantially, and is now of as good a quality as it can be. The Panel suggests that an existing vessel database be accessed if possible and linked to the data already available. This could potentially make (a probably minor) improvement, especially regarding an issue of possible multi-day trips reported as single day trip, which potentially is impairing the CPUE index of catch per day. Also, a link between the two commercial catch CPUE series (one from 1949-2002 and the other from 2003-2015) could be attempted, either by multiplying CPUE per hour with number of hours fished per day in the 2003-2015 series to get CPUE/day or by ignoring the data on hours fished in the 2003-2015 series and use CPUE/day. By considering the two series as completely separate, some information is lost. Technological creeping in the effectiveness of fishing during 1949-2002 and during 2003-2015 was not included. The bait and the fishing operation using two lines and 4-6 hooks have probably not changed a lot over time, but the use of electric wheels, quicker boats, echo-sounders, GPS, better lines, etc., might have increased fishing power, so that a given CPUE/day value in the start of the periods represent a larger stock than at the end of the period.

The new fisheries independent survey was regarded as a very important improvement of the assessment, and should be continued, if the resources are available. The uncertainty in transforming CPUE from fishing in the fisheries independent survey to camera CPUE, was not carried forward to the assessment. The CV of the transformation was requested by the Panel and supplied by the staff. It was about 0.15, which is high enough to be of a little bit of concern.

The assessment models used are generally reliable, properly applied, adequate, and appropriate for the species, fisheries, and available data. The assessment software used was, however, not able to make forecasts including process error, and thus might be underestimating the uncertainty in the forecasts. The software was not able to handle priors of the surplus production model shape parameter lower than 0.37 (measured as B_{msy}/K). A meta-analysis in the literature indicate (Thorson *et al.* 2012) that on average for Perciformes fish like the Deep7 species, it is most likely to be of a value around that. However, the data in the present assessment indicated it to be around 0.6, so it might not be a serious problem in the current assessment. A new assessment software (for instance SPiCT) should be tried next time a benchmark is coming up. This software can handle both of the above mentioned issues.

The base assessment presented at the start of the meeting was rejected, because the fishery independent index was used with a point prior, i.e. it did not account for the uncertainty in the “catchability” of the survey, only for observation error. A new run was made with a realistic prior with a CV=0.5 representing a radius of camera view of between 7m and 46m. This run was carefully considered in terms of diagnostics and outcome, and was accepted by the Panel. It changed the assessment and forecasts about 20% in terms of projected biomass and future catch at H_{msy} .

The assessment and projections indicated that the stocks are not overfished and that overfishing has not taken place in recent decades. The catch corresponding to a 50% risk of overfishing in 2019-2022 was estimated to be substantially larger than the catch in recent years. Due to the issues mentioned above with projections not including process error, and the fact that the uncertainty when linking CPUE in fisheries in the fishery independent survey to the camera CPUE, the Panel regards a reduction in future catch level compared to the output from the new base case model run be reduced by about 10%, as these two points likely will mean that the current assessment is overestimating the present and future catches at H_{msy} by around 10%.

One of the Deep7 species complex, the grouper hapu'upu'u, seem to be reduced over time in catches more than the other species. The 2016 fisheries independent survey also showed a low abundance of hapu'upu'u. It seems prudent to keep a close eye on this stock in the future.

The Panel thanked the NOAA staff for effectiveness in providing new analysis as requested and making the whole review a very positive and constructive process.

The Panel made several recommendations for future research. Especially important is a continuation of the new fishery independent survey.

Background

A stock assessment benchmark of the Main Hawaiian Islands (MHI) Deep7 bottomfish complex was conducted through fishing year 2015 by NOAA Pacific Islands Fisheries Science Center (PIFSC) scientists. The Deep7 fishery is a targeted deep-water bottomfish handline fishery operated off small boats that holds cultural and economic importance for the region. This benchmark assessment incorporated new data in the form of fishery-independent biomass estimates, and also followed data filtering recommendations from a series of five community workshops that involved fishers, managers, and scientists on best practices for filtering bottomfish commercial catch and effort data from Hawaii state commercial catch reports for use in stock assessments. As part of that series of workshops, individual fishers' catch reports have been better linked further back in time and this linking is newly applied in this benchmark stock assessment. This assessment used commercial data for the years 1949-2015, and assessed Deep7 bottomfish. The assessment was done by building upon the previous modeling framework from the past three assessments, but with improved data and data filtering as previously described, along with improvements to CPUE standardization and other modeling approaches. Unreported catch was calculated and included using catch and effort data following methods similar to those applied in previous assessments. After applying best practices from the workshop recommendations for filtering for CPUE calculation, model selection techniques were applied to select the best structural form to standardize CPUE. CPUE in the model was split into two time series (fishing year 1949-2002, and 2003-2015) in order to accommodate new effort reporting from a change in the reporting form by the state in October 2002.

CIE Reviewers were appointed to serve as panel members and conduct an impartial and independent peer review under the Western Pacific Stock Assessment Review (WPSAR) framework. The review took place at the NOAA facilities at Honolulu Harbor Pier 38, from 13-17 November 2017.

The review panel consisted of Dr. Cathy Dichmont (Australia, CIE peer reviewer), Dr. Henrik Sparholt (Denmark, CIE peer reviewer), and Dr. Steven Martell (USA, review chair).

All relevant documentation was made available on Google Drive two weeks before the meeting. The first two days were spent going through presentations by the data and assessment scientist, as well as by fishers on the operation of the fisheries and its history. The Panel recognized the tremendous amount of effort by scientist staff in preparing the assessment and by fishers, managers, and scientists regarding data filtering. Both the documentation and presentations were of very high quality. The Panel also thanks all staff and members of the public for detailed discussions to bring this Panel up to speed on the nature of fisheries operations. The Panel greatly appreciated the industry's clear and comprehensive presentation of the fishing operations and its history. Coming as a complete outsider to this area and fishery, this was especially useful for me.

The members of the Hawaiian Deep7 bottomfish (i.e., deepwater snappers and grouper) community are: (A) onaga (*Etelis coruscans*); (B) ehu (*Etelis carbunculus*); (C) kalekale (*Pristipomoides sieboldii*); (D) opakapaka (*Pristipomoides filamentosus*); (E) gindai (*Pristipomoides zonatus*); (F) hapu'upu'u (*Hyporthodus quernus*); and, (G) lehi (*Aphareus rutilans*).

Addressing each terms of reference

Non-reporting of catches in the past and at present constitute a very substantial part of the annual catch (around 50%). These are, by nature, difficult to estimate and is a major uncertainty for the assessment. Increased effort attempted to estimate the non-reported catch in the future could be an important improvement to the future management of the Deep7 stock complex. Several existing area closures to the fishery offer, however, a buffer to the uncertainty the non-reporting creates for the management.

The Panel discussed the assessment materials in the context of the terms of reference provided for this review.

TOR 1. *Are data filtering methods as decided upon by a series of regional community workshops correctly applied? Is the scientific uncertainty with respect to the input data quality and filtering methods well documented, including its potential effect on results?*

The answer is “Yes”.

Tremendous effort has gone into the data filtering of commercial data. The results were regarded as large improvements and close to, if not at, the best possible. However, a few further questions were raised.

The Panel requested documentation of catch distribution (histograms) of 1 day, 2 days, 3 days, etc., trips. This was in order to see if some multiday trips are still included as single day trips. These plots did not reveal any pattern that could be used to identify multi-day trips, nor did they seem to include information which could be used to illustrate the scale of the problem.

The Panel also asked for new plots with frequencies of trips vs catches, and distance traveled on the trips in order to identify single and multi-day trips. The histograms did however, neither give any clues to the issue.

See below for a further point about this problem with multi-day trips.

The Panel asked the question: Those fishers exiting the fishing – are they the best (experienced fishers leaving due to old age) or the worst fishers (leaving because of poor catches)? That would potentially bias the CPUE as a measure of stock abundance in one or the other direction. There was no clear answer to that question, so there seems to be little possibility to use this issue as a potential research area for improvements in the CPUE time series.

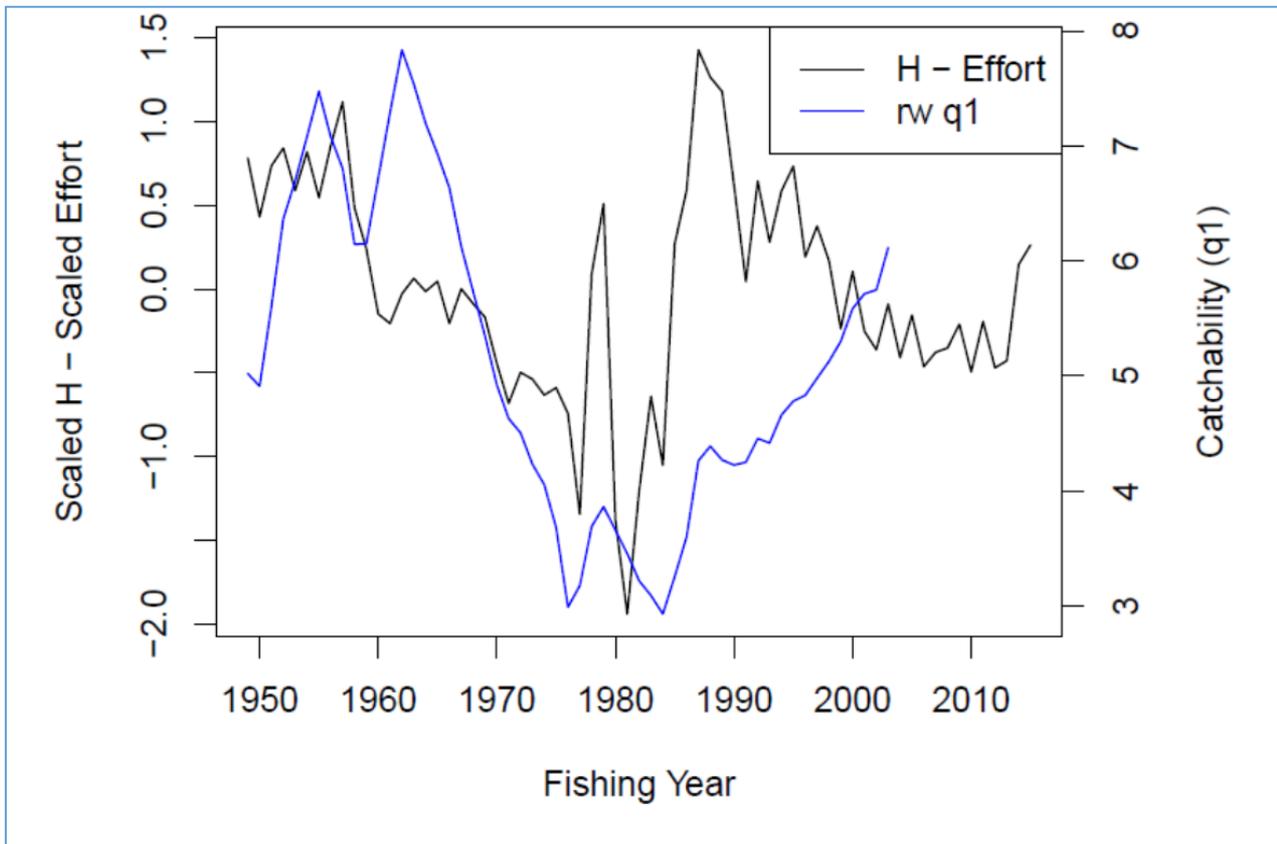
A link between the two commercial catch CPUE series (one from 1949-2002 and the other from 2003-2015) could be attempted, either by multiplying CPUE per hour with number of hours fished per day in the 2003-2015 series to get CPUE/day, or by ignoring the data on hours fished in the 2003-2015 series and use CPUE/day. By considering the two series as completely separate, some information is lost. Technological creeping in the effectiveness of fishing during 1949-2002 and during 2003-2015 was not included.

TOR 2. *Is the CPUE standardization properly applied and appropriate for this species, fishery, and available data?*

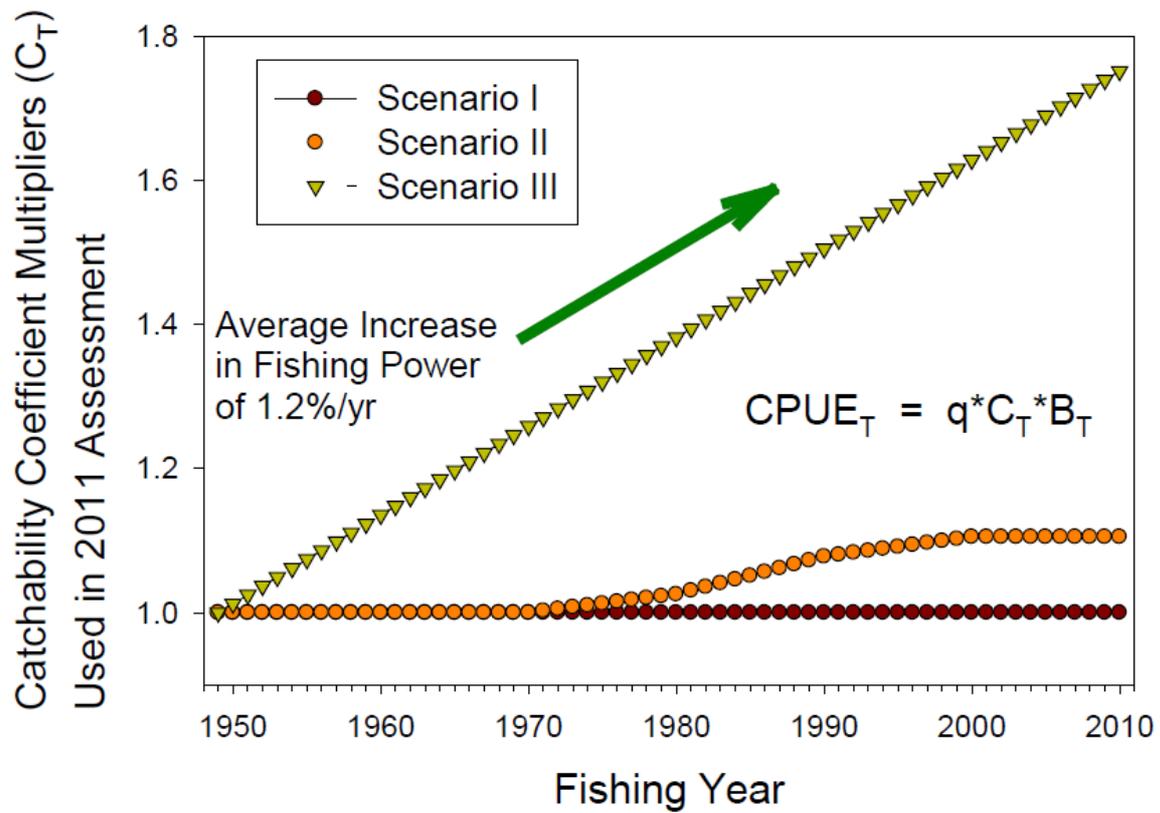
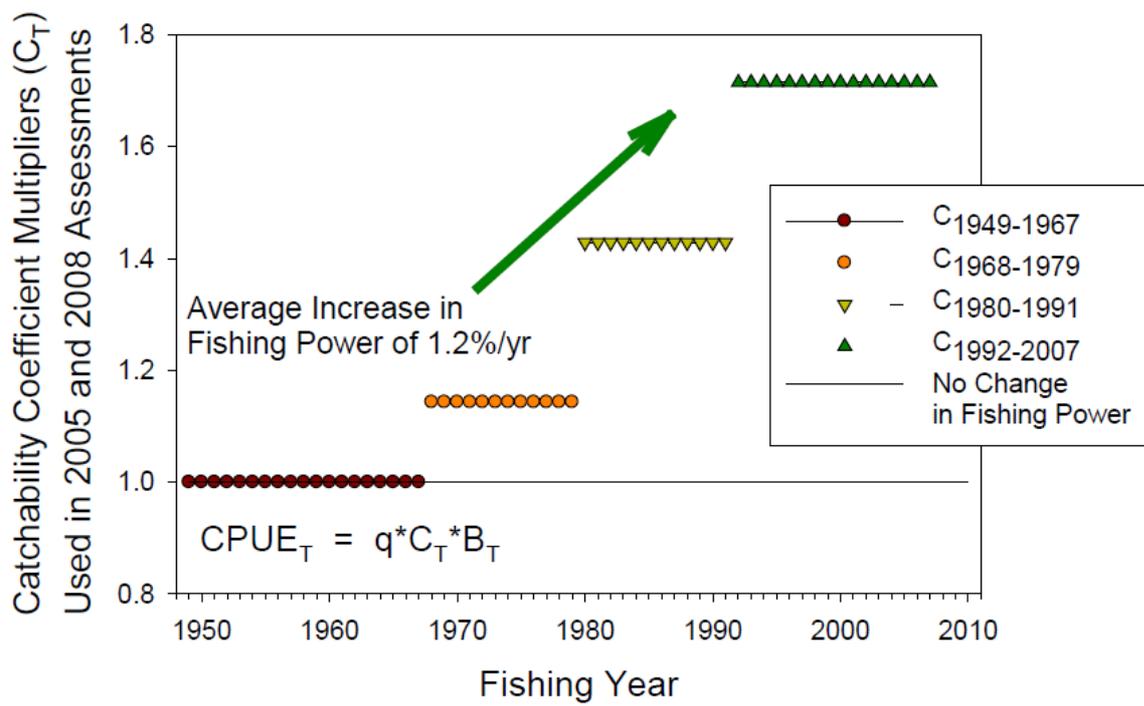
The answer is “Yes”.

The two time series could be combined into one after the GLM, as it seems that the catch/day for the first series (62 lbs per day) 2002 match the catch per hour times (8.2 lbs per hour times average fishing hours a day, about 7 hours – given 57 lbs/day) for the second time series. See further elaborations above.

Regarding technological creeping, a sensitivity test model was run and conducted with q , catchability of the commercial fleet for 1949-2002, allowed to vary by year as a random walk process, in order to see what the data tells us. The figure below shows the result. It can be seen that q peaked in 1952-1965, then falls to a low level in 1975-1985, and then increased gradually again to almost the 1952-1965 level. This is a surprising pattern and might indicate that in the period 1952-1965 a very large part of the single-day trips in fact are multi-day trips. Maybe the reduction in the sampan fleet, known to do multiday trips, coincide with the decrease in q from 1965-1975? That might be considered by the assessment group to be looked into in the future.



In the 2008 and 2011 assessments, correcting for technological creeping was attempted, and the figures below were alternative suggestions based on expert opinion and events in the fisheries. The random walk q and its increase from 1975-1985 to 2002 is rather similar to the suggested pattern from expert opinion, but the pattern before 1975-1985 is not.



It is suggested to look at the existing vessel register data to see when the sampan fleet was phased out, and to see if other data types, like motor horsepower and the like, can be of assistance to identify multi-day trips. Maybe another criteria than the present one of a 30nm limit to single-day trip definition could be explored. When this has been clarified, a somewhat similar approach as used in 2008 and 2011 would be useful to come up with realistic improvements in q over time. It might be useful to make a chronological list of major events in the fishing technology, like when sampan vessels were faced out, vessel speed increased, effective echo sounders installed, GPS used, motor reel acquired, etc.

The new fisheries independent survey was regarded as a very important improvement of the assessment, and should, if the resources are available, be continued. The uncertainty in transforming CPUE from fishing in the fisheries independent survey to camera CPUE, was not carried forward to the assessment. The CV of the transformation was requested by the Panel and supplied by the staff scientists. It was about 0.15. This adds uncertainties to the assessment, and one of the reasons why the Panel suggested that when management are using an ACL estimated from the present assessment, that about 10% are deducted from that ACL.

TOR 3. *Are the assessment models used reliable, properly applied, adequate, and appropriate for the species, fisheries, and available data?*

The answer is “Yes”.

The assessment models used are generally reliable, properly applied, adequate, and appropriate for the species, fisheries, and available data.

However, some issues were identified and these were related to the inclusion of process error in the model when forecast is included. It seemed as the historical part of the assessment was then revised, maybe because the catch used in the forecast scenarios was used as “observations” by the software, but there was no consensus on the reasons. It was also mentioned that if the model was allowed to run for a longer time (several days) the problem seems to be reduced. Therefore, the forecasts were made without process errors. The assessment might thus be underestimating the uncertainty in the forecasts.

The software was not able to handle priors of the surplus production model shape parameter lower than 0.37 (measured as B_{msy}/K), and as meta-analysis in the literature indicate (Thorson et al. 2012), it is most likely to be of a value lower than that. However, the data in the present assessment indicated it to be around 0.6, so it might not be a serious problem in the current assessment. A new assessment software (for instance, SPiCT) should be tried next time a benchmark is coming up. This software can handle this issue and the issue from the paragraph above.

TOR 4. *Is each model appropriately specified and configured?*

The answer is “No” to the base case model presented, but “Yes” to the new base case model where a realistic prior is used for the “catchability” of the survey.

The base case assessment presented at the start of the meeting was rejected, because the fishery independent index was used with a point prior, i.e. it did not account for the uncertainty in the “catchability” of the survey, only for observation error. The Panel asked for a new run with a realistic prior

with a CV=0.5 representing a radius of camera view radius of 7-46m centered around the fixed q corresponding to a radius of 20.2m. This run was carefully considered in terms of diagnostics and outcome. This run was accepted by the Panel. It changed the assessment and forecasts about 20% in terms of projected biomass and the future catch at Hmsy.

TOR 5. Are decision points and input parameters reasonably chosen?

The answer is “Yes”.

The input parameters and prior pdfs are reasonable. There is some concern about what is termed the “empirical Bayes” approach. It seems to be a bit circular and is to some extent using the same data twice: To develop the prior distribution and calculate afterwards the posterior distribution for the P1 parameter. This was demonstrated by changes in the RMSE profile for the P1 parameter under an alternative prior to r.

TOR 6. Are assumptions reasonably satisfied?

The answer is “Yes”.

The assumptions on which the modelling is based were reasonably satisfied. There are a number of critical assumptions that were briefly discussed. One is the possibility that the commercial fisheries CPUE may not be proportional to the biomass and some suggested further work were discussed. With the continued addition of annual fisheries-independent survey information it is very important that overlaps with the commercial CPUE data can assist in addressing potential violations in this assumption. The use of the survey as an (absolute) index of abundance with a point prior on catchability (through the radius of the bottom camera view) was not supported, but the proposed new base case formulation was supported.

TOR 7. Are primary sources of uncertainty documented and presented?

The answer is “Yes”.

Generally, primary sources of uncertainty are well documented and presented. The only source of uncertainty that was not carried through in the assessment model was the conversion of standardized fishing CPUE into the same units used by the bottom camera. This relationship can change from year-to-year and location-to-location (via changes in fishing q, or the radius of the camera view). Continued paired sampling will have to occur in the future to ensure the relationship between the two sampling gears is quantified each year.

The estimation procedure of unreported catch data was presented in a separate working document by Courtney & Brodziak (2011) and extended with a description of what has been done since then (which was just carrying forward the estimation principles from previously) in the new draft assessment report. This is a very important part of the overall uncertainty of the assessment, and it is suggested that more effort is put into better sampling (maybe phone interviews, questionnaires, etc.) estimates of the future unreported catches.

TOR 8. *Are the final results scientifically sound, including estimated stock status in relation to the selected biological reference points and overfishing limits, and can the results be used to address management goals stated in the relevant FEP or other documents provided to the review panel?*

The answer is “No” to the base case model presented, but “Yes” to the new base case model where a realistic prior is used for the “catchability” of the survey.

The answer to this question is “No” to the base case model initially developed for the review. The absolute abundance estimates from the fisheries independent-survey did not incorporate uncertainty in the radius of the camera visibility view, and thus the assessment uncertainty was underestimated.

However, the answer is “Yes” to the new model run, with a proper prior for re-scaling the absolute abundance estimate is scientifically sound. This modification does not change the stock status, but did change the projected catch at 50% risk of being above the MSY harvest rate relevant for setting ACL. Moreover, future stock updates will be better informed with the accumulation of fisheries-independent survey data, and these data can also better address some of the assumptions in the fisheries-dependent data.

The assessment group should be commended for many (more than 35) very useful sensitivity runs. Often very mathematically sophisticated assessment methods as used in the present assessment, take a long time to run and sensitivity analysis are not feasible. This effort and time was spent here, and it helped the review process significantly.

The new base model can be used to address management goals stated in the relevant FEP or other documents provided to the review panel.

TOR 9. *Are the methods used to project future population status adequate and appropriately applied for meeting management goals as stated in the relevant FEP?*

The answer is “Yes”.

There seems to be a problem with the forecast part of the methods and software used as process error cannot be included without changing the historical stock parameter estimates. The normal expectation that uncertainty increases the further into the future the projections goes was probably as a results not seen in the current assessment. This was not judged to be a major problem in the present situation, where the stock is well above Bmsy and harvest rate well below MSY. However, combined with the issue of not bringing forward to the assessment the uncertainty in the transformation of the fishery-independent survey catch CPUE index to the CPUE index for the camera data (see above), this might give a little too optimistic view on the future, and it would seem prudent for management when setting ACL that an additional 10% buffer be taken into consideration in the ACL setting process.

TOR 10. *If any results of these models should not be applied for management purposes with or without minor short-term further analyses (in other words, if any responses to any parts*

of questions 1-9 are “no”), indicate

- Which results should not be applied and describe why, and
- Which alternative set of existing stock assessment results should be used to inform setting fishery catch limits instead and describe why.

I recommend that the results from the base model presented not be applied for management. Uncertainty in the affected area searched by the fisheries-independent sampling gears (i.e., the scaling values (q) of the survey gears) was not well characterized.

However, I recommend the new base model that was developed during the course of the present WPSAR review be applied for management. This new base model is the same as the original base model, with the addition of a scaling parameter for the fishery-independent survey and an informative prior for the effective area searched.

With this new base case model, I can answer “yes” to all the questions in 1-9 above.

The assessment model is data moderate with important uncertainties, mostly through the large unreported catch, the sensitivity to how the survey index is treated, and model configurations. The lack of process errors in the projection model runs, and the lack of carrying through to the assessment the uncertainty in the conversion of standardized fishing CPUE into the same units used by the bottom camera, mean a small bias in the 50% risk to exceed the Hmsy in the projections. For this reason, it is recommended that the OFL-ACL is set about 10% lower than the new base model estimate of the catch corresponding to Hmsy for 2019-2021.

TOR 11. *As needed, suggest recommendations for future improvements and research priorities. Indicate whether each recommendation should be addressed in the short/immediate term (2 months), mid-term (3-5 years), and long-term (5-10 years). Also indicate whether each recommendation is high priority (likely most affecting results and/or interpretation), mid priority, or low priority.*

The research recommendations outlined in the fisheries-independent survey document are supported. Specifically, it seems worthwhile to continue the work on increasing the view area in the camera surveys and re-evaluate the maxN method (i.e., the maximum number of fish in a single frame during the viewing interval) of estimation.

A number of other research recommendations were also discussed and are outlined in bullet points below. These recommendations largely follow the order of the terms of reference and they are organized into short-term (the next 2 months), medium-term (1-5 years), and long-term (5+ years).

Short-term recommendations:

1. Adopt the new-base case model using the proper prior for the fisheries-independent survey scaling parameter.
2. Repeat RMSE profile for the initial biomass parameter (P1).
3. Repeat the sensitivity tests in the document using the new base-case model.
4. Redo the new base model for opakapaka using the same approach as the Deep7 complex, where the fisheries independent survey is re-scaled.

Medium-term recommendations:

5. Increase effort to estimate unreported future catches.
6. Continue to implement the Fisheries Independent survey on an annual basis, ensuring there are a number of paired sampling blocks where both survey gears are deployed to monitor changes in gear conversion factor used to scale the two survey gears.
7. Continue with field work and R&D for the bottom camera work. This work will be instrumental for monitoring BRFA's.
8. Join vessel size database with FRS data with the objective of being able to assign each record to a vessel class (length on water, or horse power), and thus have a better basis for e.g. filtering single-day vs multi-day trips.
9. Explore alternative classification models (e.g. regression trees, PCA, GAMs) for identifying trips targeting opakapaka.
10. Continue with the life-history work (growth, maturity) for the remaining species in the Deep7 complex.
11. Have a closer look at the year-area interactions in the CPUE data (e.g., contraction and expansion of the fishery, displacement of effort due to BRFA's), or other possible covariates (e.g., decadal scale environmental variables, currents).
12. Continue with the CPUE standardization efforts in light of any new information.
13. The panel discussed creating another data set where the CPUE series is continuous from 1949-2016. In this case, use the catch per day (by ignoring the hours fished) for the post 2002 data, such that there is only one overall time series for fisheries-dependent CPUE data.
14. Explore alternative parameterization of the surplus production model that allow the B_{msy}/k ratio to fall below values of 0.378.
15. Explore alternative models that make use of mean weight data (e.g., delay-difference model), especially for the opakapaka assessment given the recent life-history information.
16. Explore a history of the gear changes over time and how the advent of modern reels, increased vessel speed, and loss of institutional memory has affected fishing power over time. For example, what proportion of the fishers land 90% of the total reported catch, and has this proportion decreased over time?
17. Continue to address the life-history differences in the Deep7 that could result in changes in the prior distribution for r in this stock complex.
18. Explore alternative software tools for conducting this stock assessment. The recommendation is not restricted to Bayesian methods only.

Long-term recommendations:

Several of the medium-term recommendations mentioned above will likely take longer than 5 years or are expected to be ongoing long-term projects, as long as this assessment is conducted.

The NMFS review process

The review process worked very well. Documentation and presentation were of a very high quality. Documentation was sent out two weeks before the meeting using Google Drive. The meeting was

conducted in an efficient, engaged, and positive atmosphere. The presentations were done very well. The public attending were very constructive and engaged in their interventions.

The guidelines to the reviewers from the CIE secretariat were very clear and to the point.

The exchange of knowledge between the reviewers and the scientific staff was very fruitful, it seemed for both parties.

The presentations of all the important aspects relevant for the review were much appreciated. Especially useful and not often done, were the presentation of previous assessments and advice.

I tried hard to think of possible improvements to suggest, but could not come up with any. The NMFS review process has evolved over time, and seems now to have reached at very high standard in my opinion.

All in all, a very good process seen from the reviewer perspective for doing a comprehensive and in-depth review.

References:

Thorson, James T., Jason M. Cope, Trevor A. Branch, and Olaf P. Jensen. 2012. Spawning biomass reference points for exploited marine fishes, incorporating taxonomic and body size information. *Can. J. Fish. Aquat. Sci.* Vol. 69, 2012.

Appendix 1. Review background material

- Deep 7 bottomfish benchmark stock assessment for review (not to be distributed beyond reviewers): Benchmark Stock Assessment of Deep 7 Bottomfish Using Data through 2015 (draft NOAA Tech Memo). ~150 p.
- Report from Hawaii Bottomfish Commercial Fishery Data Workshops, 2015-2016. NOAA Admin Report. ~75 pp.
- Estimates of Bottomfish Abundance in the MHI in 2016 Based on Fishery-Independent Surveys. NOAA Tech Memo. ~50 p.
- Previous stock assessment NOT used for management purposes:
Brodziak, J., A. Yau, J. O'Malley, A. Andrews, R. Humphreys, E. DeMartini, M. Pan, M. Parke, and E. Fletcher. 2014. Stock Assessment Update for the Main Hawaiian Islands Deep7 Bottomfish Complex Through 2013 With Projected Annual Catch Limits Through 2016. . U.S. Dep. Commer., NOAA Tech Memo. 59 p.
- Independent peer review consensus report for Brodziak et al. 2014 stock assessment:
Neilson, J. 2014. Stock Assessment Update for the Main Hawaiian Islands Deep7 Bottomfish Complex Through 2013 With Projected Annual Catch Limits Through 2016. Center for Independent Experts, Wellington 6035, New Zealand, 27 p.
- Previous stock assessment used for management purposes:
Brodziak J, Courtney D, Wagatsuma L, O'Malley J, Lee H-H, Walsh W, Andrews A, Humphreys R, DiNardo G. 2011. Stock assessment of the main Hawaiian Islands Deep7 bottomfish complex through 2010. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-29, 176 p. + Appendix
- Relevant management information (Council FEP and amendment for setting annual catch limits):
 - Western Pacific Regional Fishery Management Council. 2009. Fishery Ecosystem Plan of the Hawaii Archipelago. Section 5.3 only, 6 p.
 - Western Pacific Regional Fishery Management Council. 2011. Omnibus Amendment for the Western Pacific Region to Establish a Process for Specifying Annual Catch Limits and Accountability Measures. Section 3.1 only, 11 p.
- Reference on unreported to reported catch ratios:
Courtney, D. and J. Brodziak. 2011. Review of unreported to reported catch ratios for bottomfish resources in the Main Hawaiian Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Ser., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Internal Rep. IR-11-017, 45 p.

Appendix 2. Statement of work

Statement of Work for

Center for Independent Experts' Contribution of Reviewers to the Western Pacific Stock Assessment Review of the 2017 Benchmark Stock Assessment for the Main Hawaiian Islands Deep7 Bottomfish Complex

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards.

(http://www.cio.noaa.gov/services_programs/pdfs/OMB_Peer_Review_Bulletin_m05-03.pdf).

Further information on the CIE program may be obtained from www.ciereviews.org.

Scope

A stock assessment benchmark of the Main Hawaiian Islands (MHI) Deep7 bottomfish complex was conducted through fishing year 2015 by PIFSC scientists. The Deep7 bottomfish fishery is a targeted deep-water bottomfish handline fishery operated off small boats that holds cultural and economic importance for the region. This benchmark assessment incorporated new data in the form of fishery-independent biomass estimates, and also followed data filtering recommendations from a series of 5 community workshops that involved fishers, managers, and scientists on best practices for filtering bottomfish commercial catch and effort data from Hawaii state commercial catch reports for use in stock assessments. As part of that series of workshops, individual fishers' catch reports have been better linked further back in

time and this linking is newly applied in this benchmark stock assessment. This assessment used commercial data for the years 1948-2015 and assessed Deep7 bottomfish, by building upon the previous modeling framework from the past three assessments, but with improved data and data filtering as previously described, along with improvements to CPUE standardization, and other modeling approaches. Unreported catch was calculated and included using catch and effort data following methods similar to those applied in previous assessments. After applying best practices from the workshop recommendations for filtering for CPUE calculation, model selection techniques were applied to select the best structural form to standardize CPUE. CPUE in the model was split into two time series (fishing year 1948-2003, and 2003-2015) in order to accommodate new effort reporting from a change in reporting form by the state in October 2002.

Requirements for CIE Reviewers

Two CIE Reviewers are being sought serve as panel members and conduct an impartial and independent peer review in accordance with the SoW and ToRs herein under the Western Pacific Stock Assessment Review (WPSAR) framework (https://www.pifsc.noaa.gov/peer_reviews/wpsar/index.php). CIE reviewers shall have:

- Working knowledge and recent experience in the application of multispecies and single species stock assessment models including statistical catch-at-age and production models sufficient to complete a thorough review in accordance with the SoW tasks and Terms of Reference (ToRs) as specified herein;
- Expertise with measures of model fit, identification, uncertainty, forecasting, and biological reference points;
- Familiarity with federal fisheries science requirements under the Magnuson-Stevens Fishery Conservation and Management Act;
- Understanding of small-scale multispecies fisheries as well as artisanal fisheries and fishing practices;
- Familiarity with hook-and-line fisheries;
- Expertise in the assessment of slow-growing fisheries species, and;
- Excellent oral and written communication skills to facilitate the discussion and communication of results.

Tasks for Reviewers

Pre-review Background Documents

Approximately two weeks prior to the peer review, the CIE reviewers will be provided (via electronic mail or made available at an FTP site) the necessary background information and reports for this peer review. The CIE reviewers shall read all documents in preparation for the peer review including:

- Deep 7 bottomfish benchmark stock assessment for review (not to be distributed beyond reviewers): Benchmark Stock Assessment of Deep 7 Bottomfish Using Data through 2015 (draft NOAA Tech Memo). ~150 p.
- Report from Hawaii Bottomfish Commercial Fishery Data Workshops, 2015-2016. NOAA Admin Report. ~75 pp.
- Estimates of Bottomfish Abundance in the MHI in 2016 Based on Fishery-Independent Surveys. NOAA Tech Memo. ~50 p.

- Previous stock assessment NOT used for management purposes:
Brodziak, J., A. Yau, J. O'Malley, A. Andrews, R. Humphreys, E. DeMartini, M. Pan, M. Parke, and E. Fletcher. 2014. Stock Assessment Update for the Main Hawaiian Islands Deep7 Bottomfish Complex Through 2013 With Projected Annual Catch Limits Through 2016. . U.S. Dep. Commer., NOAA Tech Memo. 59 p.
- Independent peer review consensus report for Brodziak et al. 2014 stock assessment:
Neilson, J. 2014. Stock Assessment Update for the Main Hawaiian Islands Deep7 Bottomfish Complex Through 2013 With Projected Annual Catch Limits Through 2016. Center for Independent Experts, Wellington 6035, New Zealand, 27 p.
- Previous stock assessment used for management purposes:
Brodziak J, Courtney D, Wagatsuma L, O'Malley J, Lee H-H, Walsh W, Andrews A, Humphreys R, DiNardo G. 2011. Stock assessment of the main Hawaiian Islands Deep7 bottomfish complex through 2010. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-29, 176 p. + Appendix
- Relevant management information (Council FEP and amendment for setting annual catch limits):
 - Western Pacific Regional Fishery Management Council. 2009. Fishery Ecosystem Plan of the Hawaii Archipelago. Section 5.3 only, 6 p.
 - Western Pacific Regional Fishery Management Council. 2011. Omnibus Amendment for the Western Pacific Region to Establish a Process for Specifying Annual Catch Limits and Accountability Measures. Section 3.1 only, 11 p.
- Reference on unreported to reported catch ratios:
Courtney, D. and J. Brodziak. 2011. Review of unreported to reported catch ratios for bottomfish resources in the Main Hawaiian Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Ser., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Internal Rep. IR-11-017, 45 p.

Panel Review Meeting

Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The meeting will consist of presentations by NOAA and other scientists to facilitate the review, to provide any additional information required by the reviewers, and to answer any questions from reviewers.

Contract Deliverables - Independent CIE Peer Review Reports

The CIE reviewers shall complete an independent peer review report in accordance with the requirements specified in this SoW and OMB guidelines. Each CIE reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in **Annex 2**.

Other Tasks – Contribution to Summary Report

The CIE reviewers will assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. The CIE reviewers are not required to reach a consensus, and should provide a brief summary of each reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Foreign National Security Clearance

When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: <http://deemedexports.noaa.gov/> and http://deemedexports.noaa.gov/compliance_access_control_procedures/noaa-foreign-national-registration-system.html. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance

The place of performance shall be at the contractor's facilities, and in Honolulu, HI.

Period of Performance

The period of performance shall be from the time of award through December 31, 2017. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

Schedule of Milestones and Deliverables: The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Within two weeks of award	Contractor selects and confirms reviewers
Approximately 2 weeks later	Contractor provides the pre-review documents to the reviewers
November 2017	each reviewer participates and conducts an independent peer review during the panel review meeting
Within two weeks of panel review meeting	Contractor receives draft reports
Within two weeks of receiving draft reports	Contractor submits final reports to the Government

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards:

(1) The reports shall be completed in accordance with the required formatting and content (2) The reports shall address each ToR as specified (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (<http://www.gsa.gov/portal/content/104790>). International travel is authorized for this contract. Travel is not to exceed \$10,000.

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

NOAA Fisheries Project Contact:

Beth Lumsden
NOAA Fisheries
FRMD/PIFSC/NMFS/NOAA
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Honolulu, Hawaii 96818
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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations addressing Annex 2 Terms of Reference questions.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.
 - a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

 - b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

 - c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

 - d. Reviewers shall provide a critique of the NMFS review process, which shall include suggestions for improvements of both process and products.

 - e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToR, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:
 - Appendix 1: Bibliography of materials provided for review
 - Appendix 2: A copy of the CIE Statement of Work
 - Appendix 3: Panel Membership, presenter information, or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

External Independent Peer Review by the Center for Independent Experts under the Western Pacific Stock Assessment Review framework:

2017 Benchmark Stock Assessment for the
Main Hawaiian Islands Deep7 Bottomfish Complex

For questions 1-5 (and each sub-question therein), reviewers shall provide a “yes” or “no” response with explanations to provide clarification and will not provide an answer of “maybe”. Only if necessary, caveats may be provided to these yes or no responses, but when provided they must be as specific as possible to provide direction and clarification.

1. Are data filtering methods as decided upon by a series of regional community workshops correctly applied? Is the scientific uncertainty with respect to the input data quality and filtering methods well documented, including its potential effect on results?
2. Is the CPUE standardization properly applied and appropriate for this species, fishery, and available data?
3. Are the assessment models used reliable, properly applied, adequate, and appropriate for the species, fisheries, and available data?
4. Is each model appropriately specified and configured?
5. Are decision points and input parameters reasonably chosen?
6. Are assumptions reasonably satisfied?
7. Are primary sources of uncertainty documented and presented?
8. Are the final results scientifically sound, including estimated stock status in relation to the selected biological reference points and overfishing limits, and can the results be used to address management goals stated in the relevant FEP or other documents provided to the review panel?
9. Are the methods used to project future population status adequate and appropriately applied for meeting management goals as stated in the relevant FEP?

10. If any results of these models should not be applied for management purposes with or without minor short-term further analyses (in other words, if any responses to any parts of questions 1-9 are “no”), indicate
 - Which results should not be applied and describe why, and
 - Which alternative set of existing stock assessment results should be used to inform setting fishery catch limits instead and describe why.

11. As needed, suggest recommendations for future improvements and research priorities. Indicate whether each recommendation should be addressed in the short/immediate term (2 months), mid-term (3-5 years), and long-term (5-10 years). Also indicate whether each recommendation is high priority (likely most affecting results and/or interpretation), mid priority, or low priority.

12. Draft a report (individual reports from each of the panel members and a Summary Report from Chair) addressing the above TOR questions.

Annex 3: Tentative Agenda
2017 Benchmark Stock Assessment for the
Main Hawaiian Islands Deep Bottomfish Complex

Honolulu, Hawaii
November 13-17, 2017

Day 1, Monday November 13

1. Welcome and Introductions
2. Background information - Objectives and Terms of Reference
3. Fishery
 - Operation
 - Management
4. History of stock assessments and reviews
5. Data
 - State of Hawaii Fisher and Dealer Reporting Systems
 - Life history information
 - Fishery-independent survey

Day 2, Tuesday November 14

6. Presentation and review of stock assessment

Day 3, Wednesday November 15

7. Continue review of stock assessment

Day 4, Thursday November 16

8. Continue review of stock assessment
9. Public comment period
10. Panel discussions (Closed)

Day 5, Friday November 17

11. Continue panel discussions (Closed; morning)
12. Present results (afternoon)
13. Adjourn

Appendix 3. List of participants

WPSAR POCs:

Benjamin Richards - NOAA PIFSC and presenter of the fishery independent survey
Marlowe Sabater - Western Pacific Regional Fishery Management Council

PIFSC assessment authors:

Annie Yau - NOAA PIFSC and presenting the data workshops
Brian Langseth - NOAA PIFSC and presenter of the assessment
John Syslo - NOAA PIFSC and presenting some assessment aspects
Jon Brodziak - NOAA PIFSC and presenter of past assessments
Maia Kapur - NOAA PIFSC

Other PIFSC scientists:

Mark Fitchett - NOAA PIFSC
Felipe Carvalho - NOAA PIFSC
Beth Lumsden - NOAA PIFSC

Invited speakers/experts:

Joe O'Malley - NOAA PIFSC and presenting life histories of the Deep7 species
Kimberlee Harding - Hawaii DAR
Kurt Kawamoto - NOAA PIFSC and presenter of the history of fisheries
Sarah Ellgen - NOAA PIRO and presenting management perspectives

Members of public:

Leonard Yamada - Fisher
Roy Morioka - Fisher
Layne Nakagawa - Fisher
Nathan Abe - Fisher
Ed Watamura – Fisher

Review panel:

Cathy Dichmont – Australia
Steven Martell (Chair) - USA
Henrik Sparholt – Denmark